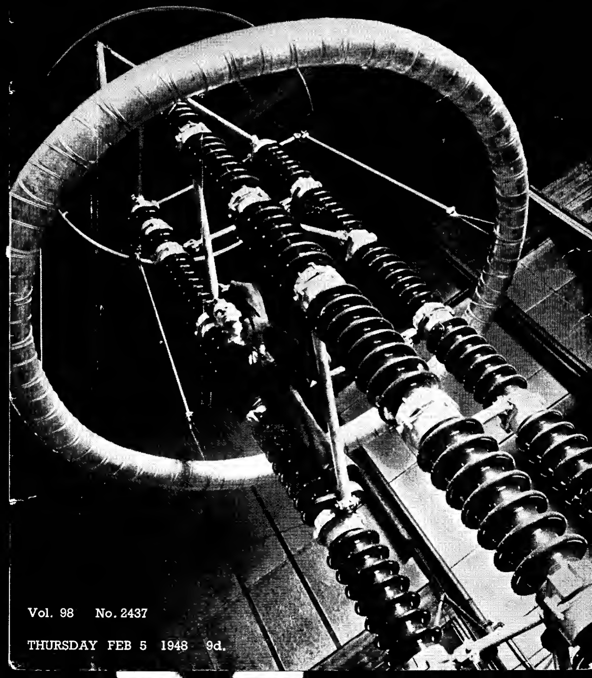
THE MODEL ENGINEER



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The MODEL ENGINEER

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SMOKE RINGS

Our Cover Picture

● THIS WEEK, the picture selected is of a high-tension lightning-arrester, designed to protect high-tension electric power transmission lines. There is something majestic about the appearance of this device, designed to tame the majesty of the heavens, and the angle of the shot, so subtly chosen by the photographer, does much to enhance this impression.

Is Speed Worth While ?

● WHEN JUST before the close of our last volume I ventured to break a lance with the advocates of speed, I rather expected that the speed-merchants among our readers, of whom there are quite a few, would have rushed into the fray to support their special views. So far only one of them has taken up the challenge, Mr. F. G. Buck, who stoutly defends the efforts of model engineers to achieve speed. It may clear the air if I say that the views I expressed were mainly inspired by a feeling of alarm that the whole world was becoming speed-crazy and so tending to disrupt the normal flow of a peaceful and well-ordered life. There will, of course, be divided opinions about this, and I am not at all sure that advancing years has not something to do with my own desire to take life a little more leisurely. From the model engineer's point of view, however, I agree that there is a good deal to be said for the joy of high-speed achievements in certain kinds of work. Mr. Buck scores a point in referring to the speedy service of the fire-engine or the ambulance in saving human life and property, but apart from certain well-recognised advantages of speed in the requirements of normal life, the model engineer may have a special objective in building the " fastest-ever " as a tribute to his ingenuity and skill. This is particularly so when model building merges into sport, as is evidenced in the racing events for cars, planes, and boats. Mr. Buck defines this very aptly when he says :—" Model engineering as a hobby is indulged in for one purpose only, and that is for the pleasure to be derived from it. It is indeed fortunate that the interests of model engineers are as widely varied as they are, and while one may like to construct a galleon and install it in a glass case, another prefers to build a racing hydroplane mainly because he knows (or should know) that there is no finality to his work and therefore no loss of interest. There is no compulsion in the matter. Those who wish to build model galleons, locomotives, or aircraft are quite at liberty to do so, and anyone who dislikes the sight and sound of models travelling faster than their prototype's scale speeds has no need to endure the spectacle against his will. In his absolute freedom to choose and model what he wishes, lies much of the attraction of the hobby. When my new racing car attained 85, 87, and 90 m.p.h. on its first, second and third outings,

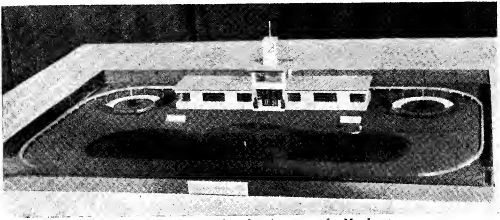
after three years spent on its construction, I can assure you that enjoyable experiences were present in full measure! The car, incidentally, is powered by an ordinary I.C. engine, and not by a jet as your 'Smoke Ring' rather tends to convey. Model racing car rules have already 'outlawed' jet propulsion for competitions by insisting that the drive be transmitted through one or more road wheels, and I should not be surprised if the M.P.B.A. also have, or intend to have a rule preventing the use of jets. If there is sufficient interest in this form of propulsion, why not provide a special class in competitions, instead of trying to discourage their use?" Well, I think that Mr. Buck has made out a good case for the experimental and sporting type of model engineer, and I think I cannot do better than conclude the argument with my congratulations on his broad-minded outlook on the hobby, and on his own extremely clever demonstrations of what speed models can do on the track.

A Bradford Beam Engine Model

● A WORKING model beam engine is to be placed on view at the Cartwright Memorial Hall, Lister Park, Bradford, in February, and the authorities are at present engaged in collecting information about the beam engines of the Bradford district. Several firms own beam engines and have promised to submit data concerning them. One engine has been running for over a century and is still working satisfactorily. The beam engine model to be placed on view is being loaned by Mr. W. D. Hollins, of Birkenshaw, Bradford, and visitors will be able to set the model in motion by pressing a button.

A Northampton "Model Centre"

● ARISING OUT of the very successful exhibition recently held by the Northampton Society, ideas have been forthcoming for the establishment in that town of an up-to-date "model centre." So far the plans have only reached the stage of pleasant anticipation, but they have been crystallised into model shape, a photograph of which I present herewith. The proposed layout includes a boating lake 150 ft. long, two race-car and pole-flying tracks, a multi-gauge locomotive track and an elaborate club building which, in addition to the usual meeting rooms, would include a permanent exhibition room. Altogether a very attractive scheme. Following the exhibition a very enjoyable dinner was held on which occasion an electric clock was presented to Mr. W. A. Wells, the Hon. Secretary in recognition of his untiring services in the organisation of the exhibition.



The model for a proposed engineering centre for Northampton

A North Devon Society

● I AM pleased to hear from Mr. J. E. Hutchinson that the new North Devon Society has got away to a good start. It caters for readers in all the North Devon area and petrol and steam engines and boat models are well represented in the membership. An "M.E." traction engine, a "Juliet," and a "Hielan' Lassie" are among the principal models completed or under construction. An exhibition at Easter is being planned. The Hon. Secretary is Mr. E. A. Bramwell, 17, Mill Street, Bideford, who will be pleased to send particulars to any prospective member.

An Orpington Recovery

● I AM sure that all power-boat men will be pleased to know that Mr. W. Whiting of the Orpington Society is making steady progress towards good health again after his long illness. He asks me to express his grateful thanks to the many friends who have made enquiries as to his welfare. Mr. Whiting was the founder of the Orpington Society, and for a long time served it well as Honorary Secretary. He will be known to a wider public for his fine model steam yacht *Rose Marie* which has been described in our pages.

Percival Marshall

PETROL ENGINE TOPICS

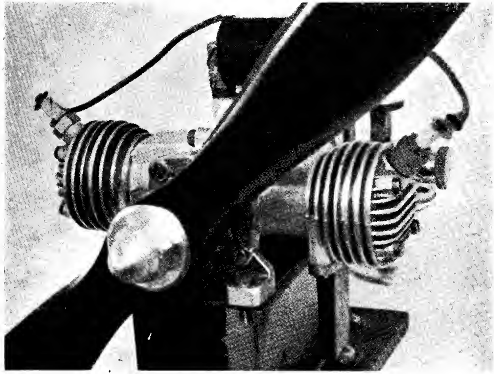
A 10-c.c. Flat Twin Two-Stroke Engine

by Edgar T. Westbury

ALTHOUGH it is some time since I last produced a new petrol engine design, and there has recently been a temporary absence of *Petrol Engine Topics* from the pages of THE MODEL ENGINEER, it would be a mistake to suppose that this has been due to any lack of interest in the subject, or that my activity in the development of these engines has declined. On the contrary, I have put in quite a lot of time at the drawing board, and also in the workshop, on various jobs which produce very little to show for the trouble taken, but are none the less essential to real progress.

A famous general is reported to have said that he strongly objected to war, because it interfered badly with Army manoeuvres. Similarly, the necessity to concentrate on the production of a finished engine design sadly disrupts the development work which is necessary for the production of new designs. Paradoxical, but true!

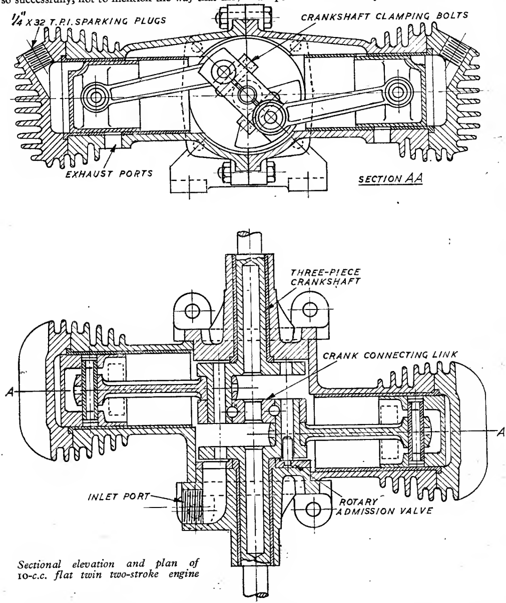
It will be apparent to intelligent readers that unless one succumbs to the ever-present temptation to "mass-produce" engine designs which are largely repetitions except for details of superficial appearance or dimensions, development work must necessarily become more and more difficult as time goes on. In pursuance of this policy which I have often proclaimed in these pages, namely, that of continually widening the scope and variety of model petrol engine design, it is necessary to investigate new possibilities, and tackle new problems which are bound to arise as soon as one departs from the beaten track. Conscientious design entails much more than drawing pretty pictures on paper; one must be quite sure that the brilliant ideas in them will really work, individually and collectively, and that they can be incorporated in a compact and mechanically sound system of construction. Most vital of all, in the class of engines in which we are interested, is the need to ensure that the various components of the engine can be cast



The "Craftsman Twin" 10-c.c. engine

or otherwise produced, and that they can be machined by methods within the capacity of the average model engineer. These features have been carefully studied in all my engine designs, and the fact that so many readers have exploited them so successfully, not to mention the way that they have been extensively copied by other designers, may be allowed to speak for itself.

The engine now to be described is of a type which has often been discussed in model engineering circles, though comparatively few attempts among amateurs to construct such engines can be traced. There can be little doubt of the attractiveness of the "flat twin"—or more correctly, the horizontally-opposed twin—either of the two-stroke on the four-stroke type; the latter is perhaps the more familiar, at least in this country, where it has been extensively adopted for motor-cycles. Flat twin two-strokes, on the other hand, have been very little used for this purpose, in spite of the fact that they appear to be in many respects highly suitable for it; they have, however, been much favoured in America for outboard marine motors, and within recent years, miniature engines of this type for model aircraft have been commercially



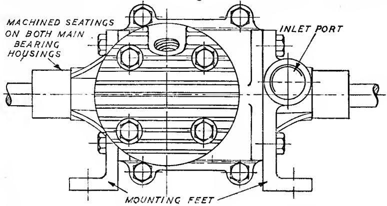
Sectional elevation and plan of 10-c.c. flat twin two-stroke engine

produced. In adopting this form of design, therefore, I do not claim complete originality, but there are several features in my particular version of it which are a little out of the ordinary, including simplified methods of construction, and adaptability.

The most obvious theoretical advantage of the flat twin engine over the single or the more common side-by-side twin is its inherently superior dynamic balance. I use the word "theoretical" because this advantage is not always realised in practice, and depends largely on details of design. Basically, however, the accepted form of opposed twin with a two-throw crank fulfils the essential requirement of correct balancing for a reciprocating engine. A mass moving in one direction can only be *perfectly* balanced by an equal mass moving at equal velocity in the same plane but in the opposite direction. This ideal condition is not attained in the usual form of flat twin engine, for two reasons ; one is the transverse "couple" caused by the swing of the connecting rods in opposite directions, and the other is the longitudinal "couple" due to the offset of the crankpins.

The former can be eliminated only by adopting a much more complicated form of crankshaft and connecting rod arrangement, and the latter can be reduced by keeping the axial distance between the cranks as short as possible ; it is clear that in any case the condition is much better than in the side-by-side twin, in which the centre lines of the reciprocating piston cannot be a less distance apart than the outside diameter of one cylinder. In the flat twin engine, it is possible to place the opposed cylinders exactly in alignment and thus eliminate any offset of the reciprocating parts ; but this is not desirable in practice, because it encourages skimping of crankpin bearing width and web structure, and introduces offset thrust and bending stresses in the connecting rods. These effects are most serious when, as often happens, the rods are kept short to reduce the overall width of the engine from one cylinder head to the other.

The offset couple, however, can at least be partially balanced out by means of small balance weights on the outer webs of the crankshaft, and this method works well in practice. Objections to the comparatively small amount of offset of the cylinders are often raised, but nearly always on the grounds of appearance and very little else. The above mechanical considerations apply equally well to both two-stroke and four-stroke engines.



End view of engine, looking from cylinder-head

By duplicating or multiplying opposed pairs of cylinders, it is possible to cancel out offset couples, and engines of this type are becoming increasingly common in aircraft and automobile practice, mainly because of the advantages which they offer in respect of compactness, low frontal area, and low head room, as compared to other cylinder arrangements. Many aircraft designers have pointed out that horizontally-opposed engines could be built completely into the wing structure of an aeroplane, thereby eliminating all the drag and much of the weight of the normal engine nacelle.

The type of opposed twin engine having only one crankpin, with forked or articulated rods connected to pistons both moving in the same direction, offers no advantages in respect of balance over the single-cylinder engine, and is almost non-existent in I.C. engine practice, though it has been used to some extent in steam and compressed air engines. If employed in a four-stroke engine, the firing intervals would be irregular (as in the 180-deg. side-by-side twin) ; and in a two-stroke engine, it would eliminate the possibility of using crankcase compression. At least one example of a two-stroke engine of this type, however, has been produced, in which stepped pistons and annular charging pumps were employed ; and a modified arrangement, using a two-compartment crankcase with a centre crankshaft bearing, and crankpins on the same place, is possible, but of dubious advantage.

In the normal flat twin four-stroke engine, the cylinders fire on alternate revolutions, and thus the firing intervals are equally spaced, and the frequency of power impulses is twice that of a single-cylinder engine. But in the corresponding form of two-stroke engine, the two cylinders fire simultaneously, and the frequency of power impulses is the same as that of a single-cylinder engine. To many engine fanciers, this is a great disadvantage, as the engine lacks the impressive high-pitched beat of a side-by-side

twin two-stroke, but it is doubtful whether this has any practical significance in engines running at the high speeds now common in miniature practice.

The only real disadvantage in the simultaneous firing twin is the necessity for special ignition equipment capable of producing two sparks at once. But this is not an exorbitant price to pay, in consideration of the fact that this is the simplest possible form of twin I.C. engine, which unlike any other form of twin, requires neither an induction manifold, separate crankcase compartments or admission arrangements, nor an ignition distributor. The two simultaneous sparks can be obtained in various ways, using either coil or magneto ignition, as will be described later. In the case of the present engine, I have devoted a good deal of attention to the development of a satisfactory ignition system, and I can confidently assure readers that no misgivings need be felt as to the success of this part of the design.

It may, incidentally, be mentioned that a good deal of time has been wasted by some experimenters on futile attempts to produce a dual spark from a normal type of ignition coil, which may have led to condemnation of the flat twin two-stroke generally ; I must confess to having been swayed by second-hand evidence of this nature in the past, until I decided to investigate the matter for myself. A further point of interest in this respect is that real or imaginary ignition difficulty once induced an inventor to patent a flat twin two-stroke having a long pipe connecting the two combustion chambers, with a single plug in the middle of it. This engine was, I believe, produced under the name of the "O.P.T." (one-plug twin), but its career was very short-lived, and I do not think it would be difficult to suggest reasons why.

The "Craftsman Twin" Engine

This design has been produced in collaboration with Craftsmanship Models Limited, of Ipswich, who, as their announcements state, are "specialists in unusual models," and have already acquired quite a sound reputation in this field. Castings and parts for the engine are available, and arrangements are in hand for producing complete engines. The many readers who examined specimens of the castings and parts at last year's Model Engineer Exhibition, will not need to be informed that they are of outstanding quality, gravity die-castings being used for the main structural components, both accuracy and high finish being thereby assured. The material used in these castings is a special aluminium alloy containing copper, having high tensile strength with good machinability, and other components are of a comparable high quality.

It was decided to produce an engine of a capacity within the 10-c.c. limit, to enable it to be used in model racing cars, a purpose for which it has particularly attractive possibilities. Head room is always at a premium in model cars, if they are to resemble full-sized cars in general proportions, and the small vertical dimensions of the flat twin engine allow it to be adapted to various methods of drive without entailing unsightly projections or bulging of the bodywork of a car. Although not much used in present-day automobile practice, flat twin engines have been quite popular in the past, well-known examples being the A.B.C., Rover, and Jowett cars, which made their appearance in the '20s. The first-named of these was a real enthusiasts' car, and highly appropriate for prototype modelling.

The engine is equally suitable for use in a model speedboat or cruiser, where its low centre of gravity assists stability, and it is capable of being completely enclosed under the decking. In model aircraft, the larger sizes of engines are at present out of favour, but I do not think they will become permanently obsolete, especially in view of present interest in controlled flying models. Here again, the engine lends itself to an attractive and efficient method of mounting and housing.

Several features of earlier engines of my design have been incorporated in this engine, including the use of the disc type rotary admission valve. Quite a number of optional features are provided to increase the adaptability or scope of application. For instance, the endplates, which are integral with the main bearing housing, may be arranged for bulkhead, bearer frame or cradle mounting, or provided with feet for direct base mounting ; they may also be changed end for end to suit method of installation or driving. The main shaft being double-ended, the drive may be taken from either end with equal facility. A built-up crankshaft is specified in the design, but it is possible to use a solid crankshaft if this should be preferred by the constructor.

Main Structural Features

It will be seen that the body of the engine is composed of two identically-shaped castings, each of which comprises one cylinder barrel and half the crankcase barrel. These have a flat joint face on the vertical centre line of the engine and are bolted together with four bolts ; the end faces of the crankcase barrel have flanges to which each of the main bearing housings are attached by four studs or set screws.

Thin liners are fitted to the cylinder barrels, and detachable heads are attached, in this case also four studs or set screws being used. A metal-to-metal spigot joint is provided on the cylinder heads, which seat on the lip of the liners, and incidentally serve to locate and hold the latter positively, preventing any tendency for them to shift. The transfer ports, at least, must be cut in the liners before their insertion, but this is not absolutely necessary in the case of the exhaust ports, and there is some advantage in forming or finishing them afterwards.

The pistons are intended to be machined from solid cast-iron, as no better material, or method of production, has so far been found, but composite or fabricated pistons offer some interesting possibilities, which have often been referred to in these pages, and may be exploited at the option of the constructor.

One disadvantage of the flat twin engine, from the aspect of installation facility, is its abnormal width over the cylinders, as compared with the compactness of a vertical engine in this dimension. This is, of course, at its worst in a

four-stroke o.h.v. flat twin, but other forms of this engine may also be undesirably wide for such purposes as installation in a boat of limited beam, particularly if it restricts accessibility to the sparking plugs or essential adjustments. In the effort to keep the width down to the minimum, flat twin engines are often made with abnormally short stroke, or very short pistons and connecting-rods. While these measures may sometimes serve their intended purpose, they are often attended with undesirable effects, such as rapid wear of working parts or other mechanical parts. I have a distinct aversion to extremes of any kind, and I have, therefore, kept to fairly sound rules of design in the proportions of working parts in this engine.

One feature which helps, among other things, to reduce engine width in this engine, however, is the use of pistons with sunk deflectors, which shortens the overall length of piston from skirt to deflector tip without introducing any disadvantages. On the contrary, it has beneficial effects, by reducing the superficial area of the piston crown and alleviating local heating, also by shortening the transfer passage, and thereby cutting down "dead volume" in the crankcase. I have experimented a good deal with pistons of this type, and have found them in no way inferior to the orthodox type in respect of scavenging, though they may be a little more difficult to make, and in cases where rings are to be fitted, may have to be lengthened, or modified in respect of the gudgeon pin position.

(To be continued)

An Engine's Second Floor

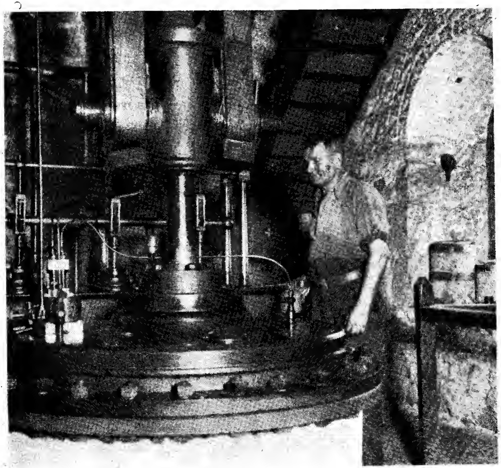


Photo by] [*F. D. Woodall*

The middle chamber or second floor view of a Cornish pumping engine at a Cornish china clay pit. Built in the early 1850's, it was erected at its present site about 1910. The cylinder is 50-in. bore. Cornish china clay is a high priority commodity in our export drive for dollars

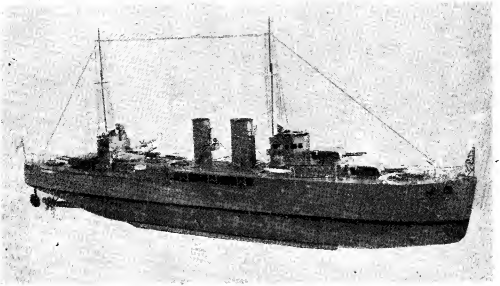
"TWICE LOST"

by "Owd Gaumless"

DURING the early stages of the recent war, Junior and I were faced with two things commonly experienced by model engineers—empty "stocks" and the question of what to make next. But as so often happens in these cases, the decision was made for us, and the next "keel" laid with enthusiasm.

The Battle of the River Plate forced the issue, for in common with the rest of our sorely tried that H.M.S. *Exeter* had been lost in action. Thereafter, we handled our model with reverence and in respect for her prototype.

"Warships Week" came along whilst we were still mourning her loss and Hazel Grove spurred us to complete our model for use as a *piece de resistance* in the showroom window, arguing that the public forked out the shekels much better when sorrowing. And so it proved!



The camera angle detracts from the actual length of 45 inches

population, we wholeheartedly applauded the daring exploits of the cruisers *Exeter*, *Achilles* and *Ajax* in action against a much more heavily armed opponent—the *Graf Spee*. As we had often considered the construction of a "County" class cruiser, the modified version typified by H.M.S. *Exeter* sent us scampering into the workshop with yet another urge to "create."

We found a huge beam of yellow pine, seared and charred by the Manchester blitz, cleaned it up, carved, hollowed and searched frantically for fast-disappearing materials wherewith to construct such things as the boiler, engine and other fittings.

Then came an appeal from Stockport who were in urgent need of models for an exhibition to be held in the War Memorial. We quietened them by sending the *Dominia* (see "M.E." 5-4-45). Hazel Grove followed suit but, as the *Dominia* had already departed, we had no model to lend. A whip round all my friends for whom I have made models from time to time produced the desired result, and the Electricity Department show windows became a "One-man" show. Both exhibitions proved real money spinners for the "Savings" effort.

Shortly after these shows came the sad news

When we received the request we had just a fortnight to go, and all we had to show was a finished hull, complete with decks only roughly fitted, a twin-drum boiler and a Bassett-Lowke "Eclipse" engine. We had no material that could readily lend itself to the construction of top-hamper, guns, etc. But, we made it!

Discretion and the niceties of scale were thrown to the wind, hour after hour was spent sweating and toiling in the workshop. Common $\frac{3}{16}$ in. and $\frac{1}{8}$-in. copper tube for the guns, tin-plate for the turrets and top-hamper, all soft-soldered into position, shoe-maker's eyelets for portholes. Coffee strainer mesh for funnel spark arresters, turned dowelling for ammunition hoist covers, three propellers the centre one doing the work the other two idling. Plane with wooden hull, copper wire struts, and biscuit-tin-plate wings.

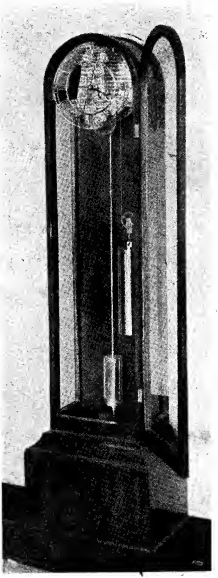
We have always felt rather ashamed of what is (to us!) a botched job but others have not apparently been of the same opinion, and we have at last succumbed to the pleadings of one persistent friend, and disposed of our old and trusted show-piece, money-spinner and imperfect reproduction of a much more famous Hero.

Thus, the second loss. Forgive us if we wipe away a furtive tear.

A Gravity Escapement Clock

by C. B. Reeve

A DESCRIPTION of the gravity escapement clock entered by the writer at the 1947 "M.E." Exhibition, which was awarded a Silver Medal, will, I hope, be of interest to readers. Normally, in a regulator clock of this type, the escapement is positioned at the back of the movement out of sight, which is rather a pity, as its action is most interesting to observe.



Before giving details of the construction of the movement, it would be as well, perhaps, to describe the action of the escapement. From the drawing of the front view, it will be seen that there are two arms, with the escape wheel of four teeth midway between them. At a little distance from the centre of the escape wheel and projecting therefrom, are eight small pins, four on one side of the wheel and four on the other, their function being to raise the pallet arms alternately as the wheel rotates. Attached to each pallet arm is a block, that on the left-hand arm being on the outside, and that on the right being on the inside, the wheel rotating between them. Attached to the same arbors as the pallet arms are two further arms which hang down behind the back plate of the movement; these two arms have each a projection at their lower extremities which are the impulse pins, the pendulum hanging between them. As the escape wheel rotates to the left, the left-hand pallet arm is raised by one of the pins in the escape wheel and at approximately the same moment the extemity of one of the long teeth of the escape wheel arrives at the position of the left block and is held by it. The pendulum meanwhile is also swinging to the left, where it contacts the left-hand impulse pin, and in its further excursion to the left, carries the block on the left-hand pallet arm away from the escape wheel, the latter rotating until stopped by the block on the right-hand pallet arm. After the pendulum has released the escape wheel, the pallet arm is resting on the pendulum-rod, and it is the weight of the pallet arm that constitutes the drive for the pendulum, and keeps it going. The action of the right-hand pallet arm is precisely the same. Two banking pins are fitted on the front plate of the movement, their purpose being to limit the movement of the pallet arms so that the pendulum is for a portion of its excursion quite free of the impulse pins; also, the banking pins allow the pins on the escape wheel to have a little lead or run before commencing to raise the pallet arms.

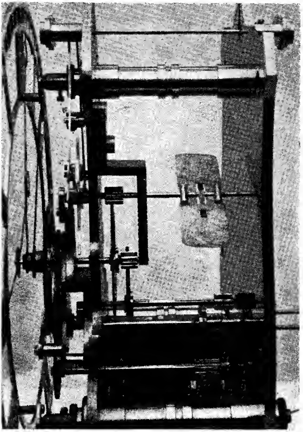
Wheels

The construction of the clock was commenced with the making of the wheels. These were cut in the lathe, a cutter frame being rigged up on the slide-rest. The rough blank wheels were mounted in some special chucks, made by the writer to suit his lathe, the teeth of the wheels being cut immediately after the blanks had been turned to size without de-chucking them (ensuring that the hole in the wheel was true with the teeth). The plates were next taken in hand. They are somewhat over $\frac{3}{16}$ in. in thickness and were cut out with a fretsaw, finishing afterwards with files, buffs, etc. Next, the pillars were turned up and screw-cut; these pass through holes in the plates, and are tightened with ring nuts as shown in the side elevation.

Cutting the Pinion-heads

The pinion-heads, all of twelve leaves each,

were cut in the lathe with the aid of a home-made apparatus. They are made from mild-steel, drilled and taper-broached, and after cutting the leaves, were case-hardened; being thin, the case-hardening completely penetrated the metal, so the temper was let down somewhat. The pinion arbors were turned up from suitable cast-steel, care being taken to turn the taper to match that of the pinion-head, the result being that the latter fitted like the proverbial glove. Brass for the wheel collets was driven on to the arbors and turned up to fit the holes in the wheels. No after-broaching of the holes in the wheels was done; all the fitting was done by hand turning with a graver and hand-rest. The wheels and pinions were next run in the plates, taking particular care of the depthing. It will be noticed that the centre "seconds-hand wheel" is mounted in the centre of the movement and between two cocks, one on the outside, and the other on the inside of the front plate; this is necessary to allow room for the fly fitted to the escape wheel arbor to operate. It may appear to some readers somewhat odd to have a fly on the escape wheel arbor; this, however, is very necessary, as there being but four teeth to the wheel it would run too quickly and "miss the boat" and probably "trip" on its arrival at the stop block.



Side view of Mr. Reeve's clock mechanism

The driving drum or barrel was made according to the directions given in a series of articles on clockmaking by Mr. George Gentry in THE MODEL ENGINEER during the year 1929. To digress for a moment, I should like to pay tribute to this author's clear and explicit articles, which have been of great help to myself and, no doubt, to other readers.

In addition to the winding ratchet, it will be noticed that there is another ratchet with teeth pointing in the reverse direction; this is the maintaining device, and prevents the clock stopping during the winding-up process.

Gearing Arrangement

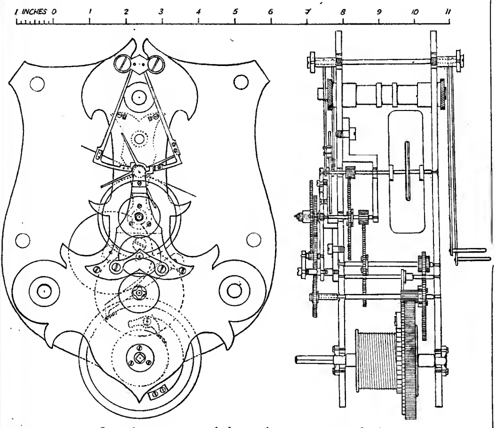
There is a spring (not seen in the drawing) located between the larger ratchet wheel and the great wheel. This spring is always in a state of tension, and keeps the clock going during the winding period, a pawl mounted on an arbor between the plates always being engaged with one of the ratchet teeth—the maintaining spring, of course, having somewhat less power than the driving weight. The arrangement of the gearing of the wheels and pinions is as follows: starting at the top with the escape wheel, this makes one rotation in eight seconds; gearing with its pinion, the seconds wheel (on which the centre second hand is fitted) has ninety teeth and makes one rotation in sixty seconds; gearing with this wheel's pinion is the third wheel, also of ninety teeth; this, therefore, makes one rotation in seven and a half minutes and, in turn, the minute-hand wheel, usually known as the centre wheel of the clock, has ninety-six teeth which, gearing with the third wheel's pinion, makes one rotation in sixty minutes; the gearing between the centre wheel and the great wheel is the usual twelve to one, and with sixteen grooves on the barrel keeps the clock going eight days. The centre wheel arbor is extended through the front plate, and carries a friction-tight motion wheel; this is geared to another wheel immediately above it, and this intermediate, in turn, drives another wheel, also of the same number of teeth to the collet of which is attached the minute hand of the clock. The arbor of this last-mentioned wheel is in the form of a tube, and revolves on another smaller stationary tube fixed to the plate, which is superimposed on the large cock, and screwed thereto with three countersunk screws. This plate is extended to carry the back pivot of the intermediate wheel, and has also screwed

to it a small bridge to carry the front pivot of this wheel.

The seconds arbor's pivot passes through the small tube, clear of touching it in any way. The hour wheel of the ninety-six teeth is fitted to a tube which revolves on the minute-wheel tube, and is driven by a pinion of eight leaves, rotating with the intermediate motion wheel. It might be thought that this rather roundabout drive of the minute wheel would cause a good exaggerated at their extremities and thereby make the action uncertain. Carrying the gravity arm arbors on bridges beyond the plates is also a help in this respect. The dial was cut out with a fret-saw, and took about a fortnight to finish.

The Case

This was a fairly straightforward piece of cabinet work, the wood for which was obtained from a secondhand furniture dealer who had,



General arrangement of the gravity escapement mechanism

deal of backlash in the minute hand; this, however, has been practically eliminated by cutting the wheels so that the teeth and spaces nearly equal one another.

The gravity arms, escape wheel, etc., were all cut from cold-rolled steel about 1/32 in. thick; the acting parts are made separately, and of steel, which has been left glass-hard. Great care was taken with the fit of the pivots of the gravity arms, as any side play here would be

amongst his stock, a large mahogany board-room extending table, and the writer managed to persuade him to part with some of the leaves. The curved "glasses" in the roof of the case are pieces of "Perspex" bent to shape by heat.

One very vital essential of a clock of this kind is that it be bolted to a brick or stone wall, otherwise the case has a tendency to rock, due, no doubt, to the heavy pendulum and rather heavy weight.

*FACTORY METHODS
in the Home Workshop
by "1121"

ONE important point must be mentioned before we leave the subject of multi-punch tools: it is not considered wise to make all the punches the same length, so that they all strike the surface of the stock together. There is considerable shock and vibration produced when a punch of any size encounters the solid metal beneath it, and if a large blanking punch and a tiny piercing punch, such as the wire punch we have shown in these illustrations, were to hit the stock at the same instant, the vibration caused by the big pick them up with their domed ends. This is a plain pin protruding from the die, against which the hole in the stock left by blanking is pushed. Many ingenious devices may be incorporated in high-speed tools to reduce time lost by this location for each stroke of the press, but these are all more or less complicated and definitely outside our sphere at present. Two small points should be noticed about this question of stops. The first is that the stop, of whatever type it may be, is placed in such a position that the pilots *draw the*

Fig. 7. A simple bending job

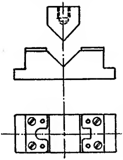


Fig. 8. A "standard" V-tool

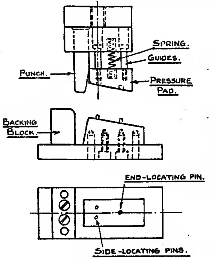


Fig. 10. The type of tool recommended to bend the component, Fig. 9

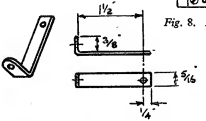


Fig. 9. A more difficult component

punch would almost certainly break the little one. For this reason, the bigger punches are always made longer, the piercing punches, if there is any great difference between their sizes, being made progressively shorter from the largest to the smallest. The actual difference in lengths need not be very great—usually about a third of the thickness of the material being operated upon, so that the first punch has just finished its shearing action through the metal when the next one starts its work. A further gain is felt as a result of this practice, which may be particularly useful to us with our modest-powered hand press—it splits up the load into a long smooth action, distributed over a greater length of stroke of the press, rather than causing the whole shock to come at the first impact.

In the drawing of our pierce-and-blank tool the simplest possible stop has been shown to locate the pierced holes under the blanking punch with sufficient closeness to enable the pilots to

stock back from it, usually by about 0.010 in. Obviously, the pilots must be allowed to take final charge of the locating, and this ensures that there is no conflict between the approximate position effected by the stop and the accurate location provided by the pilots. The second point to be noticed is that in a machine-shop where unskilled labour is being used it is necessary to provide a special location for starting a new strip. If the end of a strip were to be pushed up against the stop, the pilots would come down on solid metal, no holes having been pierced to receive them, and the tool might be damaged. A "sliding stop" is therefore provided, which, when pushed in, holds the end of the strip in such a position that the holes are pierced in the correct place to leave enough metal all round to accommodate the blank. Whether the model engineer feels he can trust himself to "sight" the strip under the piercing punches without the aid of the sliding stop is known, of course, only to him.

So much for blanking and piercing, separate and combined. The writer apologises if to some

**Continued from page 84, "M.E.," January 22, 1948.*

readers the ground covered by these notes seems to be getting outside the range of our requirements in our home shop, but press work is some of the most interesting which the tool designer is required to tackle, and it is difficult to know where to stop. Some reader, it is hoped, might like to try his hand at a simple pierce-and-blank tool, such as that described, just for the fun of it, and quite apart from any question of necessity. After all, we are mainly out to amuse ourselves.

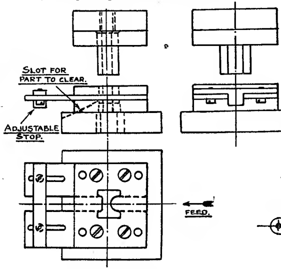


Fig. 11. *A "standard" cropping tool, with adjustable stop*

Bending

In order to give illustrations of bending, we shall have to think up a different part on which to operate, as there is no bending required on the signal arm which we have been considering. The simplest type of tool in which bending is done is that known as the "V"-tool, consisting merely of a solid die, shaped to a "V," at the angle at which the part is to be bent, and a "V"-punch to push the blank down into it. If the tool is made to produce a 90-degree bend, a great variety of parts can be bent in it, the only requirement being some interchangeable device for locating the parts so as to bring the bend into the right position and direction.

Let us assume, therefore, that one of the strips for which we made the adjustable drill jig in a previous article requires to be bent across the centre at 90 degrees, so that it shall have the appearance indicated in the sketch Fig. 7. This is an ideal job for a plain V-tool, which would be arranged as shown in Fig. 8. We resist the temptation to locate the part by means of pins through its holes, as this would prevent any possibility of the part getting bent at all, by holding the two ends from drawing inwards towards the middle when the punch comes down. We will locate, therefore, by means of two plate nests, which are attached to the die at either end. If later we want to use the tool for a different part, we have only to remove these nests and fit a new pair of the required shape.

Now we will consider another strip, Fig. 9, from which it will be seen that the bend is up at one end, and the dimensioning indicates that it must be an accurate distance from the hole in the long "leg." For this job a V-tool is not suitable. We *must* locate in the hole, and the way to ensure that the bend shall be the right distance from it is to hook the job on to a projecting pin in a die, and then knock the end down over a corner the right distance from the pin. Bearing in mind the fact that the long end of the strip will kick up in the air as soon as we tread on the overhanging part with our punch, it will be necessary to hold the job down with a spring pad while the operation is being done. This is shown in the drawing Fig. 10. It will be noticed that the whole job is arranged, not horizontally, but at a slight angle. This has two advantages over merely bending the end down vertically. If this were done, any wear on the punch, die, or guide block would lead to an enlarging of the gap between

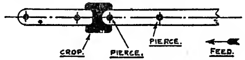


Fig. 12. *Strip layout of a pierce-and-crop tool*

the punch and die, resulting an an alteration of the angle at which the part was bent. Similarly, if the thickness of the metal were to vary slightly there would be either too large or too small a space for it. By arranging the part as shown, not only are these difficulties eliminated, as the closing of the punch and die is positive and automatic, but the further advantage is gained that the angle can be easily altered if it is found that the job is coming out incorrectly bent due to the springiness of the material.

This method, of course, cannot always be used. If two ends of a strip, or the four sides of a box have to be bent in one operation, the blank *must* be held horizontal and the bends made to come vertical. This type of job is, however, getting rather more involved than we are prepared for at the moment, and it is suggested that the two bending tools described will, between them, with the aid of interchangeable nests in the one case and a movable pin in the other, do all the bending likely to be wanted in quantity in the amateur's workshop.

Cropping

We will consider this next, as in the strip upon which we have just been operating we have a very suitable subject for a cropping tool.

Cropping, as understood in its simplest form, can be applied to a part only when it has parallel sides, as has our part, with no work to be done on them. The shaping required being confined to

the ends, we can use as our stock a strip the width of the job, with a consequent saving of material compared with the wider strip required for blanking. It should be repeated, however, that the end form cannot be located very accurately relative to the sides of the strip, as a workable allowance has to be made between the guides to allow for inaccuracies of stock width, and to enable the stock to be slid through them without the possibility of binding in tight places. In the present case this is not very serious, as the shapes of the ends are only a "finishing-off," and do not perform any important duties.

A cropping tool is somewhat like a blanking tool, in that it has a die, a punch, a stripper and guide strips. The main difference will be seen from the drawing, Fig. 11, in which it is clear that the punch extends right across the space between the guide strips, and actually beyond it on either side. It will also be observed that the punch has the form required for one end of the strip on one side, and the form of the other end on the other side.

The stop is simplicity itself, although the one in the drawing has been complicated by having been made adjustable so that strips of different lengths but with the same end shapes can be cropped off if required. Notice that there is no obstruction to prevent the part from falling away when separated from the stock, and that this is further facilitated by the clearance slot cut in the die.

It is possible to combine piercing with cropping just as easily as it can be combined with blanking, and the holes in the job under consideration can be pierced as it is cropped by arranging the piercing punches as shown in the layout, Fig. 12. Notice that they are all to the same side of the cropping punch, even though they will finally appear at opposite ends of the finished part. It would be no use trying to pierce a hole in the part after it had been cropped off and was in the process of falling away from the die.

Drawing

The last item we now have to consider is the most difficult. It may vary between a shallow tray-like part, which involves nothing more nor less than flanging, to a thing like a shell-case requiring some half-dozen operations between the initial flat blank and the final deeply-drawn component. The simplest type of part for which a drawing tool can be made is a circular cup-shaped component, with no flange or bead round the top, for which literally only a punch and die are required, with the addition only of a nest to locate the blank. The die is merely a hole, of the diameter of the outside of the cup, while the punch is a solid lump of the required inside diameter, and having the required radius on its bottom corner, which will be reproduced as the radius in the corner where the sides blend into the bottom. The die carries a circular nest on top, into which is placed the blank of calculated diameter, and the punch is simply pushed into the middle of the blank until the latter has been forced right through the die, assuming the required cup-shape on the way. Once through the die, the cup springs open very slightly, which is nevertheless sufficient to prevent its being drawn back through the die on the receding punch. The essence of this process is shown by the drawing, Fig. 13.

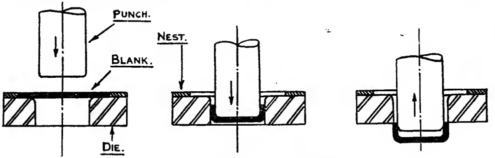


Fig. 13. The three stages of a drawing die

If an odd-shaped article is to be drawn up, however, the principle is the same, but many complications set in. Special allowances have to be made for the metal to "build up" at the corners, to prevent wrinkling or tearing, or jamming, and it is rarely that an exact shape for the blank can be constructed or calculated which will produce the required part without the necessity for trimming round the top edge. It may be mentioned in passing that as a general rule thicker material is easier than thin stuff for a drawing operation, where there is the possibility of a choice, but in our case the thickness will be limited by the power of the press at our disposal. The deep drawing of a thick shell usually requires a pretty considerable tonnage.

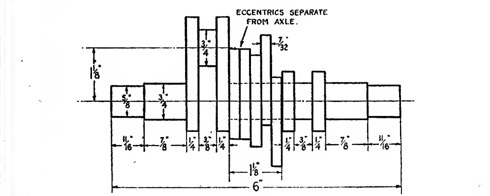
If any reader feels he would like to make a drawing die to produce some model part, say, a steam dome casing or a boiler tube-plate, all we can say is "have a go." We can't help you any more than that without knowing the exact dimensions of your job, and the thickness and nature of your material. It may come out easily or abound with snags. Tool designers should be paid to worry about whether their press tools are likely to break the back of the firm's biggest press. Not many of them are, so not many of them worry. We hope none of the tools we have been talking about do any damage to your own little private press. Anyway, we wish you luck.

Crank-Axle for "Maid of Kent" and "Minx"

by "L.B.S.C."

ON these little engines, we are up against the same problem that gives full-sized locomotive superintendents a "crank-axle headache," viz. to provide ample bearing surfaces with adequate strength in the axle and crank webs; but owing to the fact that Nature can't be "scaled," and the tensile strength of the metal in a little crank-axle is exactly the same as that in its full-sized relative, the problem isn't nearly so acute. Crank-axles on the early locomotives used to break "wholesale," and even in later years there were a few bad accidents caused by broken crank-axles. Incidentally, this is one of the reasons why outside cylinders gained favour. However, up to the time of writing, I have never heard of the crank-axle of a little locomotive actually breaking, although I've heard plenty of sad stories about webs shifting, through bad brazing or other defective methods of manufacture and, in several cases, have put the axle right.

On both the "Maid" and the "Minx," the wheel bearings in the driving axleboxes are $\frac{7}{8}$ in. wide, which leaves us exactly $2\frac{7}{8}$ in. in which to get two cranks and—in the case of an engine with link motion—five eccentrics. The centres of the cylinders are 2 in. apart (practically the equivalcnt of a Stroudley "Gladstone") but we haven't "scale" width between the inside faces of the axleboxes, because our frames are closer together, owing to the necessity of using "thicker-than-scale" wheel flanges; greater clearances are required, and our axleboxes are wider. This leaves us with $\frac{7}{16}$ in. only, between the cylinder centre-line and the face of the axlebox, in which to accommodate one crank web and half the length of the crankpin; so I have shown the webs $\frac{1}{4}$ in. thick, and used a crankpin $\frac{3}{8}$ in. long, as you will see from the illustration. With corresponding webs on the other side of each crankpin, we have left a space of $1\frac{1}{8}$ in. for five eccentrics, on an engine using Stephenson link motion; this allows for five eccentric-sheaves each 7/32 in. wide, and 1/32 in. working clearance between the whole bunch. So there you have the complete story of "how the milk got into the coconut"! The eccentrics, by the way, are proportionately as wide as those on the Brighton "Atlantics," and greater in diameter. Whatever else happens, we won't be troubled with broken crank webs; if you don't believe me, just put a piece of $1\frac{1}{4}$-in. by $\frac{1}{4}$-in. steel bar in the bench vice, and see if you can break it!



Details of the crank-axle

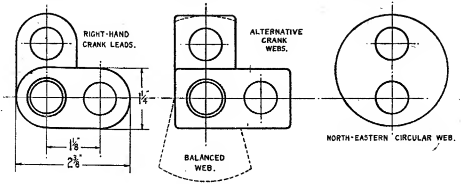
Crank Webs

Alternative patterns of crank webs are shown, to suit builders who will finish off the engine to their own pet outline. Some engines have rounded crank webs, others square, or with balance weights formed by extension of the webs; and some engines, like those of the old North Eastern, had circular webs. The axles and crankpins can be attached to the webs either by being forced in or brazed; please yourselves which method you adopt. For a press-fit axle with short crank webs, either rounded or square ends, four pieces of $1\frac{1}{4}$-in. by $\frac{1}{4}$-in. mild-steel bar will be needed, each $2\frac{3}{8}$ in. full long. Mark off one only, with centre-pops at $1\frac{1}{8}$ in. centres; drill it, say, No. 30, and use it as a jig to drill the others. Put a piece of $\frac{1}{8}$-in. silver-steel through both holes in all four webs, and see if they line up all right; if O.K., open out the holes to 39/64 in. and ream $\frac{5}{8}$ in.

Axle and Crankpins

The axle itself, and the crankpins, can be made from $\frac{3}{4}$-in. round steel; either mild- or silver-steel. For a press-fit job, the whole doings must be made in sections. The pieces forming the wheel

seats and journals are $1\frac{13}{16}$ in. finished length; the crankpins $\frac{7}{8}$ in. ditto; and the centre part of the axle $1\frac{5}{8}$ in. Chuck the longest piece in the three-jaw, and turn the wheel seats exactly the same as those in the straight axles. The parts that press into the crank-webs are turned in similar fashion. Chuck a bit of rod any size over $\frac{5}{8}$ in. diameter (a scrap of axle-steel is handy for this) and turn 1 in. or so to a very tight push fit in the holes in the crank webs. Measure it up with a "mike," and turn the spigots on the crank-pins, and the parts of the axle that will be pressed into the webs, a full 0.001 in. larger. If you have no "mike," shift the cross-slide handle half a turn back, and then bring it forward again just short of its former position. Turn a spigot with that setting, and if it just *won't* go into the hole in the web by hand, it's O.K.



Different kinds of cranks

How to Assemble

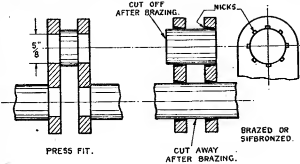
Now a word to beginners. If anybody tells you it is a difficult and highly skilled job to assemble a crank axle by press fitting, and make it to run truly, you just tell them old Curly says it's nothing of the kind, and the veriest Billy Muggins should be able to do the job with a little "common savvy" and the "know how." If a child of ten can make a truly-running press-fit crank axle with bits of a door lock for webs, and a big French nail supplying the wherewithal for the axle and crankpins, it stands to reason that *anybody* can do it better still with more suitable tools and material! Here is the way to do it; it is the way I do my own, and I've made plenty of them, goodness only knows! First of all, press one crankpin into each web. You say I told you to turn the spigot so that it *wouldn't* enter the hole? Quite right, I did. Now before you try to press in the spigot, just do the same as they would in a full-size locomotive works; that is, make the web hot. Put a bit of sheet copper or brass, bent to an angle, over each vice jaw; hold the hot web against one of the jaws with a pair of pliers, set the spigot over the hole, and if you can't manage to move the vice-handle with your knee, just enough to prevent the bits slipping, get somebody to do it for you. Then, making sure the crankpin and spigot are truly lined up, and square, turn the handle of the vice, and squeeze the spigot home. There you are—it *did* go in, after all, didn't it? And when the web cools off, the pin is not only going to refuse to budge of its own free will and accord, but would take all you've got, to drive it out with a hammer and punch!

"Ah," says the merry old "expert"—you'll find one of him in almost every club; he is related to Inspector Meticulous—"but how are you going to ensure the two webs being in line?" Simple, my dear Watson, as Sherlock Holmes would say. Just take that little scrap bit of steel that you turned to a tight push fit in the web, and poke it through the other hole. Heat the other web, and push that on it too; then line up the spigot on the pin, with the remaining hole in the web, and press that home too. The trick is done, as the two webs *must* be in line when the "test piece" is passing through the holes in both of them, and the pin is pressed into the other end.

Give the second crank a dose of the same medicine; then find two pieces of $\frac{3}{8}$-in. flat steel that will fit tightly between the webs, and prevent a cave-in when you do the rest of the pressing. Heat one of the webs at the end opposite the crankpin, and press in the outer end of the axle, with the bit of $\frac{3}{8}$-in. steel between the webs; "ditto repeato" with the second crank, then press the middle part of the crank axle into one of the webs. If you are going to use link-motion, you'll have to leave the final squeeze until you have turned up the eccentric-sheaves for motion and pump, as detailed below; or the single eccentric for the pump of a Joy-gear engine. Alternatively, you can, if desired, dispense with the pump altogether, and rely on the injector, which if made as I describe it, will give perfectly reliable service. In that case, there will be nothing on the axle between the cranks.

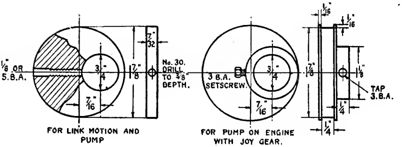
However, when you have the eccentrics ready, thread them on the centre part of the axle; then heat the metal around the hole of the last web, and press it on to the centre part of the axle, with a packing-block between each crank-web, so that they cannot be distorted. To ensure the cranks being at right-angles, before starting on the final press, lay the crank with the piece of axle attached, on something true and flat (lathe-bed or drilling-machine table would do) then set the other crank against it vertically, checking it with a try-square, stock on the flat

surface, and blade against the crank-web. Make a scratch on each, exactly opposite each other. Then heat up the web, and press on with the scratches coinciding. If you check off again quickly whilst the web is still hot, and the cranks are slightly out, catch the cold one in the bench vice, and put a big adjustable wrench on the other.



How cranks are assembled

You'll just about be able to move it enough to make the correction before it gets cold and "sets solid" in a manner of speaking. Clean up the webs, and the job is complete. As the webs were lined up by the "test piece" through the axle holes, when pressing the second web on the pin, it stands to reason that the pieces of axle pressed into the holes, must also line up truly; and unless you somehow manage to distort the webs in the pressing process—an unlikely occurrence—the axle cannot help running truly. The last crank-axle I made by the above process was for the single-wheeler "Grosvenor," and there is no sign of wobble on her big driving wheels, proof positive that the axle must be true enough.



Eccentrics

A built-up axle can be made by brazing or Sifbronzing, instead of pressing. For this, turn up an axle, same as the straight ones. Make four webs as above, but drill and ream $\frac{3}{4}$ in. to a tight fit on the axle, and nick the holes as shown, with a file. Mount the four webs on the straight axle in the position shown in the illustration, putting the eccentrics between, for a link-motion engine. Put a ring of 16-gauge soft brass wire, or 16-gauge Sifbronze, around axle and pin, on the side away from the eccentrics, and cover with flux mixed to a paste with water. Now put the whole issue in your brazing pan and heat it to a bright red, when the brass or Sifbronze will melt, flow into the nicks, and make a sound job of the joints. Let cool to black, quench in water, and clean up. If any brazing material should be sticking to the crankpins between the webs, be careful how you get it off, so as to preserve the circularity of the pins. Saw out the unwanted pieces of axle between the webs, and the projecting piece of crankpin, trim up with a file, and you're all set.

Another tip to beginners: brass wire and Sifbronze, when melted, do not flow as easily as best silver-solder, and will not penetrate a close-fitting joint, hence some of the brazed crank-axle failures that have come to my notice; but if the nicks are made as shown, the molten metal is enabled to penetrate the full depth of the joint, and a sound job results. The nicks are wedge-shaped, so that the brazing material does not go clean through the joint and out the other side; very important, that!

Eccentric Sheaves

The best material from which to make the eccentrics, is a stub-end of 2-in. diameter mild-steel shafting. Chuck in three-jaw and face the end. The toolmarks will indicate true centre; at $\frac{7}{16}$ in. from this, make a heavy centre-pop, and re-chuck it in four-jaw with this pop-mark running truly. Drill a $\frac{1}{8}$-in. pilot-hole, open out to 47/64 in. and ream $\frac{3}{4}$ in. For the five eccentrics for the link-motion engine, re-chuck in the three-jaw, turn down about $1\frac{1}{2}$ in. to $1\frac{7}{8}$ in. diameter, and part off five 7/32 in. slices. If your lathe is small and flimsy, it would be best to turn down and part off one at a time; or else mount the piece of shafting between centres, turn to size, part off almost to middle, and finish with a hacksaw, with the work in the bench vice. Each tumbler can then be separately chucked in three-jaw, and the sawn part faced off. Drill and tap for set-screws as shown.

For the pump eccentric on a Joy-gear engine, turn the $\frac{1}{4}$-in. groove after facing and drilling operations, leaving a $\frac{1}{16}$-in. flange on the end. Then part off at a full $\frac{5}{8}$ in. from the end. Drive a stub of steel rod into the hole, to serve as a mandrel; hold this in the three-jaw, and turn the boss, using a knife tool and not taking "greedy" cuts, as the cut being "intermittent," the suc-

cession of " clouts " as the work revolves and the tool hits the high spots, would knock it off the mandrel. Cut the boss back to leave a $\frac{1}{16}$-in. flange as shown, then drill and tap the boss for a 3-B.A. set-screw. I guess the above items will keep builders busy for a week or so!

Curly's " Christmas Holiday "

Your humble servant was never one to go " gadding about " much, and is still pretty company-shy, so my Christmases are spent at home with my fair lady, workshop and railway. The one just gone, at time of writing, has been a busy one for me, but it was work done in a good cause! During the past year, some good friends overseas have been very kind, so I thought I would send them keepsakes in the form of injectors, and made nine of them altogether. I only intended to make eight, but the bit of $\frac{5}{16}$-in. square rod was long enough for nine bodies, and it seemed a pity not to use up the short end. The bodies were quickly made up on the " mass-production " method, the ball-chambers being made from $\frac{1}{4}$-in. round rod, the one off-setting of the four-jaw chuck serving for all nine, no marking out being necessary; and the bodies, ball-chambers and water union screws were all silver-soldered at one heat in a few minutes, being set out on an asbestos slab which once formed part of a tram-way-car controller. The combining-cones were fitted first, one setting of the cross-slide on my Boley lathe turning them all to a press fit; they are the Holden and Brooke divided type, and all drilled No. 70. Next came the 75-size delivery cones, turned from 7/32 in. brass rod; then the steam cones, drilled No. 63. Then I made nine clacks. Having no $\frac{5}{16}$-in. brass rod in stock, I used drawn phosphor-bronze for the bodies, which are $\frac{5}{8}$ in. long and have 5/32 in. ball-valves. A supply of $\frac{1}{4}$-in. by 40 union nuts finished the job.

Every one was tried on the railway under service conditions, the engine being 26-year-old " Ayesha." They all fed her perfectly for runs of between $1\frac{1}{2}$ and 2 miles, starting instantly the water and steam valves were opened, and having little effect on the steam pressure whilst feeding on the run, although the weather was cold on the trial runs, and " Ayesha " was showing a white exhaust at the chimney, a thing she very seldom does, on account of her high superheat. Every jigger had a range from blowing-off, right down till there was not enough steam to blow the whistle; and the lowest starting pressure tried was 35 lb. No water regulation was needed at the higher pressures. As the weather was cold, the injectors had no chance to become overheated, and on several occasions I turned steam on first (against Messrs. Gresham and Craven's instructions for their full-size injectors!) but the babies started without trouble, and re-started automatically if they knocked off through the water in the tender being low, and surging clear of the outlet when running around the curves. On one occasion, the tender ran dry as I was approaching the water tank, so I didn't turn the steam off, but left it blowing from the overflow whilst I put the filling pipe into the tender. As soon as the water started to run into the tank, the injector restarted all on its own.

I did not try how high these injectors would lift, as I made them for feeding boilers, not emptying wells, or even pails; but they would have no difficulty in lifting their supply if required. I would point out, however, that ability to lift, is no guarantee that an injector would feed a boiler, for I have just seen one that would suck up water from a pail on the floor, to bench height, but nary a drop would it put into the boiler. The whole lot went out through the overflow pipe! It is hardly necessary to add that I did not make it, but it was sent to me for examination at my own request, after reading a complaint; and I have since made it feed, by fitting a set of my own cones.

For the Lover of Clocks

An Anthology of Clocks and Watches. Selected and Edited by C. A. O. Fox, D. ès Sc. (Geneva.) 68 pp. 14 plates. 8s. 6d. Published by the Editor, Valley House, Bishopston, Swansea.

" What a dead thing is a clock!" wrote Charles Lamb, who preferred—perhaps for the sake of his essay—a sundial. But most model engineers—I nearly included all model engineers—know that clocks and watches are curiously alive and often temperamental; and here, in this admirable anthology, Dr. Fox has brought together some of the most convincing evidence that something more than mere cold mechanism goes to the art and science of measuring time. His own verses on the beautiful wall clock by Robertus Harvie show that link between history and the craftsmen of horology which many of us feel when we contemplate a masterpiece of older days :—

> . . . And so, for full three hundred years,
> Untouched by human hopes and fears,
> You've worked at your allotted task,
> And more than that we cannot ask.
> Long after we have passed away
> You'll tell the time as best you may
> Until the day comes, as it must
> When you will moulder into dust,
> But leaving, when your course is run,
> A tale of duty stoutly done.

Prose and verse are mingled in this anthology; humour and solemnity are neighbours. Many items are anonymous; but readers who know their Shakespeare will find some of the familiar and apt quotations which no conscientious anthologist could possibly omit. Of the full-page illustrations of clocks and watches, historic and beautiful, nothing but praise can be recorded; the reproductions on inset art paper are first-rate.

Dr. Fox can rightly claim that his book is the only one of its kind. It has a definitely strong appeal on its literary side, and this reinforces its interest for the engineer—model or otherwise—who loves the delicate mechanisms and the craftsmanship associated with time-keeping.

—W.L.R.

FUN AND GAMES WITH YOUR SCREWCUTTING LATHE

by J. Latta

THESE notes will not appeal to those model engineers who seldom use their screwcutting gear except to provide a feed for turning, and who cut all their screw threads with dies.

I have no quarrel with this point of view; in fact, it is my own attitude when time presses, as is mostly the case, but, nevertheless, it is useful to realise that your lathe has many possibilities in thread cutting beyond the list of pitches given on the maker's chart.

This list of threads for which change-wheels are provided may, or may not, cover all requirements, depending generally on the price paid for the lathe. An inexpensive tool is generally lacking in wheels to cut metric pitches, and may even want wheels to suit pipe and gas threads, such as 19 and 28, which often come up in repair work.

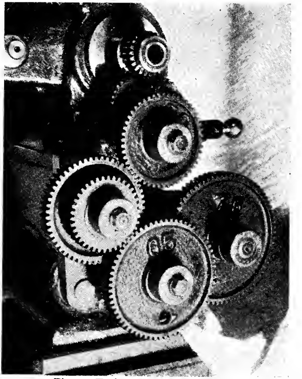


Fig. 1. Train set up to cut No. 1-B.A.

The keen model engineer with enough cash in his pocket — a combination nhich often does wot go together—can remedy any gaps in his set by placing an order with the makers, but it often happens that a special thread is wanted in a hurry and there is no time to get new gears; it is then very useful to be able to contrive something that will fill the bill.

Let us first examine the question of cutting metric threads, and before we talk about make-shifts, let us see what is required if we wish to cut these threads in the regular way.

The accepted metric equivalent to the inch is 25.4 mm., and multiplying this figure by 5 gives us the whole number 127. So, if space can be found on the swing-plate for a wheel with 127 teeth, nothing better can be desired as a translating wheel to cut all the usual metric pitches.

In the long ago, a full set of change-wheels for an English lathe comprised all numbers in steps of five from 20 to 120 teeth, and there was usually little difficulty in accommodating the 127 wheel, as it was not much larger than the 120. However, as all threads commonly required can be cut with many fewer wheels than this, it is now general practice to provide a much smaller range in the interests of economy, especially with lead screws of fine pitch, such as are generally found on small lathes in the inexpensive amateur class. A 65 wheel is often the largest provided, and a 127 would be impossibly large for the swing-plate.

Fortunately there are several alternatives to meet the case. One of the best is to have a 127 wheel and also a 40 to gear with it, cut to twice the diametral pitch of the standard wheels, thus making the overall diameters of the two new wheels equal to about the dimensions of a 63 and 20 in the normal set, so that there is no difficulty in accommodating them.

With this arrangement, a compound train must always be used with the 40 and 127 wheels as the last pair in the train, the various pitches being obtained by using different combinations on the first two wheels. For example, with an 8 t.p.i. lead screw.

1 mm. pitch would use :—

$$\frac{\text{Drivers } 50}{\text{Driven } 50} \times \frac{40}{127}$$

1.5 mm. pitch would use :—

$$\frac{\text{Drivers } 30}{\text{Driven } 20} \times \frac{40}{127}$$

and so on.

The usual solution for an inexpensive lathe is the provision of an extra 63-tooth wheel, but it should be noted that to give the best results, this must be used as a *driver*, in which case it is hardly inferior to a 127-wheel.

With an 8 t.p.i. lead screw as before 1 mm. pitch would be cut with a train

$$\frac{\text{Drivers } 63}{\text{Driven } 50} \times \frac{20}{80} = 25.39825 \text{ t.p.i.}$$

which, it will be seen, is an exceedingly close approximation to 25.4. Actually the error is only about .001 in. in 15 in. of screw; a difference which is quite inappreciable in any lathe.

There is generally some difficulty about getting the wheels to gear when using a train with the 63 as a *driver*, unless an idler can be put somewhere on an extra stud, it is more usual to use it as a *driven* wheel, and as a substitute for a 127, as it has practically half the number of teeth; but it should be noted that the error in this case is very much greater than when used as a driver, although it will suit well enough for most jobs.

As a matter of interest, it cuts 25.2 t.p.i. instead of 25.4, an error of about .008 in. in every inch, which may be too much for some jobs.

It is a curious coincidence that a 63 wheel will act for the purpose either as a driver or a driven wheel, but it is not generally realised how different the results are.

Another alternative is to use a 21-tooth wheel as a driver in place of the 63; the value of the driven wheels being reduced by one-third to suit.

Another combination that will give exactly the same results as the 63 used as a driver but using smaller wheels in the train is,

$$\frac{\text{Drivers } 36}{\text{Driven } 50} \times \frac{35}{80} = 1 \text{ mm. pitch.}$$

If an 18-tooth wheel can be used without leaving too little metal around the bore, then it can be substituted for the 36 in the above combination, and a 40 can be used in place of the 80.

Accurate Metric Threads

These trains have possibilities for those who wish to cut accurate metric threads for a minimum outlay in new wheels, and might even be worth consideration by lathe makers who are keen to cut costs.

The B.A. series of threads have a metric basis, but with the exception of No. 0 which equals 1 mm. pitch, it will usually be found impossible to arrange any wheels out of a standard set to cut them, even using a metric conversion wheel to start off with, and as these threads are generally cut with dies, it is not worth while to buy special change-wheels to cut them accurately.

However, occasions do arise when it may be useful, perhaps, for a repair job and no die available, to be able to set up the change wheels to give a very close approximation, and those who have $3\frac{1}{2}$ in. Drummond lathes will find a very useful table in the "M.E." of April 29th, 1920, giving wheels for all the usual B.A. threads, and many metric pitches also, without using any wheel outside the standard range.

It is seldom realised that the number of possible combinations with the usual set of wheels is very vast indeed, probably running into thousands, even allowing for those that will not gear. Most of these are, of course, quite useless, but out of this great number there are some which come close enough to any of the well-known threads to make them useful in cases where they cannot be cut exactly with the usual wheels. The difficulty is to discover them without working out all possible arrangements; a task enough to appal even the greatest enthusiast.

Needless to say, the usual methods of calculating wheels do not apply when trying for any of the odd pitches, as it can be taken for granted that the correct wheels will not be in the set, and in any case we are looking for a close approximation and not an exact result.

A Child's Aid to Arithmetic

As the method I am about to describe involves the use of a slide-rule, it may scare off a few experimenters, as I have found that the use of this child's aid to arithmetic is jeered at by many model engineers who ought to know better. In my own school days its use was "taboo," presumably because it gave you the answers without enough effort, but I am led to believe this has now been corrected in present day methods of learning.

However, it is a worthwhile and inexpensive item of anyone's kit, and once its use has been mastered, it is likely to be put to good use whenever there are "sums" to be done.

Assuming, therefore, some familiarity with a slide-rule, the method of discovering wheels to give a good approximation to an awkward thread, is as follows.

First, you want a list of all the pitches you know the wheels for; this will be the maker's list in fact, plus any others you know of, or care to work out for yourself.

It is useful to have an extra stud available on the swing plate, so that you can add a further pair of wheels even to an existing compound train; as the essence of the game consists of exploring, by means of the slide-rule, the effect of adding a further pair of wheels to a known train.

This extra stud, if required, is not difficult to fit as a rule, and details of a suitable pattern will be given later on.

Given then, your list of known threads, choose one, and place this number on the C scale of your slide rule, so as to coincide with the required number of threads on the D scale below.

The two scales of the rule are now set in the required ratio of the new pair of wheels we wish to discover; the driver on the C scale, and the driven on the D, and it is a simple matter to see whether any whole numbers which coincide, or almost coincide, are wheels which are available.

If nothing seems suitable, we set the rule again for another pitch from the list, and try again until something turns up. In practice the perfect pair seldom come to light quickly, but there will be a good few that are not far off, and these should be noted to be sorted out later to see what comes nearest. Note that the numbers to be used on the rule are the number of threads per inch, whether taken from the list or the number to be sought.

An Example

To give an example. Suppose we wish to cut 4-B.A. which has a pitch of .66 mm. or 38.5 t.p.i.

Taking our list of known trains and starting near the beginning, we select 10 t.p.i.

We set the slide-rule with 10 on the C scale above 38.5 on the D scale, and proceed to examine the possibilities. It will be seen that 20 is exactly above 77, so if you have these two wheels available, they will fill the bill.

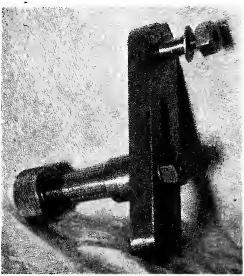


Fig. 2. Extra arm and stud

However, it is very unlikely that a 77 is in the set, so we look a little further and note that 25 does not coincide with anything very closely, and neither does 30; and in any case it would need a follower of 115 or more, which is getting far too large. So we can conclude that there are no modifications of the 10 t.p.i. train that will be of any use to us.

We now try the next on our list, say 11 t.p.i. and set the rule accordingly with 11 opposite to 38.5 ; we are immediately rewarded by seeing that 20 is exactly opposite 70, and if these two wheels are available, your search is ended, as by compounding your existing train for 11 t.p.i. with the additonal pair 20 driver and 70 driven you can cut 38.5 t.p.i. or 4-B.A. exactly.

Of course, it does not always happen that exact wheels will be found as in the above case, and you may have to be content with a close approximation. For instance, if the above wheels do not suit, and you proceed to try 12 t.p.i. it will be found that 25 and 80 are fairly near, and if worked out will, in fact, give 38.4 t.p.i. which is pretty close, and only a 1/10th part of a thread out in an inch of screw, an error which is unlikely to be of any great moment for most purposes requiring a 4-B.A. thread.

The persevering model engineer will not be content with using the maker's list only as a starting point, but will add many of the weird and wonderful pitches which result from trains normally useless. For example, 25 and 55 cuts 17.6 t.p.i. with an 8 per inch lead screw, and might have possibilities as a starting point for compounding, although useless as a pitch itself. Further possibilities result from using larger drivers than driven for a part of the train, but I will leave enterprising readers to explore these avenues for themselves, as it is soon evident that one can ring the changes almost indefinitely.

It is not a bad plan to prepare a list of the potentially useful threads your lathe will *not* normally cut, and to keep this handy.

Solutions can then be sought at odd moments, such as during railway journeys, when it is at least as useful as solving crossword puzzles.

Fig. 1 shows a train set up to cut No. 1 B.A. which is equal to 28.2 t.p.i. The wheels used in this case are :—

$$\left.\begin{array}{l}\text{Drivers } 50 \times 38 \times 20 \\ \text{Driven } 55 \times 65 \times 75\end{array}\right\} = 28.223$$

with a lead screw of 4 t.p.i. It will be noted that the extra arm and stud are in use.

A word of warning about the actual process of thread cutting with any of these trains, and in fact with any metric or odd pitch. The clasp nut must never be disengaged from the lead screw

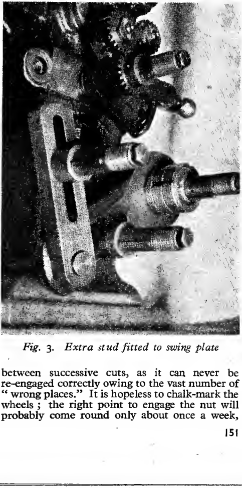


Fig. 3. Extra stud fitted to swing plate

between successive cuts, as it can never be re-engaged correctly owing to the vast number of " wrong places." It is hopeless to chalk-mark the wheels ; the right point to engage the nut will probably come round only about once a week,

and you will not recognise it when it does come !

So the nut must be left in gear, and the lathe reversed to bring the tool back to the starting point. This is not a great hardship except, perhaps, in the case of very long screws.

The practice of setting the top slide over to half the angle of the thread and feeding the tool with it, is much quicker and better than the old plan of going straight in at right-angles with the cross slide, but many turners still seem to prefer the older method for some obscure reason.

With some slides it is difficult to angle the top slide sufficiently without the handle fouling something, and this is a point which should be attended to by the designer of any lathe intended to be used for screwcutting.

In other cases, the top slide has no micrometer index fitted, and this is a point which the owner can easily attend to himself. The top slide index is not essential, of course, but makes the proper depthing of the thread much easier.

In this respect, it is useful to hang on the workshop wall a table showing the depth to feed in the angled slide for all the various standard pitches to produce a full depth thread. For the 55-deg. angle Whitworth thread it equals the normal depth taken at right-angles multiplied by 1.127, and the equivalent for other thread angles such as the American 60-deg. and B.A. $47\frac{1}{2}$-deg. is easily found by a simple calculation.

Possibly the screwcutting gear is more often used to provide a feed for turning or boring than to cut screws, and it is usually the case, especially with a small cheap lathe, that the finest possible feed that can be set up is a great deal too coarse for many jobs.

Various devices involving ratchet feeds have been described in the past to get over this difficulty, but they are not really satisfactory at high speeds, as the ratchet does not work properly under these conditions, and unfortunately it is small diameter work running at a high speed that needs the finest feed.

The best way out of the difficulty is to provide an extra stud so that an additional pair of gears can be used in the train, and as this extra stud will also come in very useful to accommodate screw-cutting wheels which could not be got in otherwise, it will prove to be quite a useful piece of extra equipment.

Dimensions and details of a suitable arm and stud must be devised to suit individual cases, but, as a general rule, it is not difficult to arrange for an extra slotted arm to be bolted to the existing swing-plate, utilising a portion of the slot to pass the necessary bolt. Quite a flimsy affair will work, as the pressure on the gears is not great, but it is much better to make something really substantial, even if it means a little extra time spent in filing or milling the slot in a thickish piece of stock.

Fig. 2 shows the extra arm and stud I made for my own lathe, and in Fig. 3 it is seen in position on the swing-plate. There is no point in giving dimensions, as anyone making up a similar fitting would have to make it to suit his own lathe.

When setting up a train for a fine feed, the most useful wheels are, of course, the very large and the very small ones, and when the extra stud is brought into use, it is generally the case that all the really small wheels are already in use, and the only wheels left are getting on for being the same size so that the extra reduction they afford is not great.

A way out of this dilemma which I have used with success is to make up a couple of the very smallest wheels in brass, and cut the teeth with a flycutter. For feed wheels, great accuracy of tooth form is unnecessary, and if the cutter is carefully filed to the profile of one of the existing wheels, a very reasonable gear results.

The diameter swept by the cutter should be kept as small as possible, so that it can be run fairly fast, and it will not take very long to cut the teeth.

With an extra stud and two extra 20 wheels, I can get feeds of nearly 1,000 per inch on my own lathe ; and, although this is much finer than normally required, it shows what can be done.

Many expensive lathes are provided with a quick-change gearbox, and this is a boon and a time saver, not only for screwcutting, but also in ordinary turning, as it enables a feed to be quickly selected to suit the job in hand.

Unfortunately, this refinement is beyond the reach of most of us, and it is not an easy matter to design one that can be fitted as an extra ; although not beyond the bounds of possibility to the ingenious mechanic.

As a partial substitute, when using feed trains, if it can be arranged that the first wheel in the train, which is generally a 20, can be quickly slipped off and a larger one substituted without readjusting any other part of the train, except a lowering of the swing-plate, it will mean that quite a fair range of feeds can be obtained with the minimum of effort.

Naturally the range is limited, as it is not advisable to use a very large wheel as the first of the train unless the mandrel is running at a moderate speed. However, if the normal feed train can be set up with this in view, and a choice of, say, from 200 to 450 per inch, is available by changing one wheel only, it is very valuable.

In conclusion, I would remind those "hard-boiled" turners who do not believe in fine feeds and comic set-ups for screwcutting that these notes are penned only for those who find "fun and games" in playing around with their lathes.

Small Locomotive Supplies

From Mr. H. Clarkson, 30, George Terrace, Barlby, Selby, Yorks, we have received a copy of the second edition of his price list of castings, parts and drawings of miniature locomotives from 7-mm. to $\frac{3}{4}$-in. scale. Mr. Clarkson specialises in L.N.E.R. engines and he stresses the importance of fidelity to prototype, so far as appearance is concerned. The illustrations in the price list give clear indication of the degree of realism achieved and we think it is very satisfactory.

The prices asked are reasonable. We can commend this price list to the attention of our readers ; it costs 6d.

THE FARE AT FAREHAM

AT the opening of the recent two-day exhibition held by the Fareham Model Engineering Society, Councillor P. H. Glover declared that, in his opinion, the building of models is a more creditable and satisfying achievement than many of the spare-time pursuits popular among young people. Since the formation of the Society in 1947, he continued, without any external support it had continued to build up membership. "Because of their spirit of independence we should help them to soar to even greater heights," he went on. "We have read in the Press that nothing 'goes' in Fareham, we must see that this young and virile society refutes that statement."

Mr. Glover suggested that Fareham people should subscribe for competition trophies and, if 300 people would subscribe 5s. each, the encouragement would justify the gesture, particularly in the case of the younger members.

Fareham is the home of a number of well-known men of the sea and it is interesting to note that a Vice-Admiral and a Commander are patrons of the society. A fine selection of ship models among the exhibits reflected the marine aspect of the society's activities; among these were included model yachts, cabin cruisers, waterline models and the brig *Madlena*, a clinker-built sailing dinghy and Mr. R. G. Bosberry's "500 class" M.T.B. which gained the first prize at the Portsmouth Society's Exhibition and a certificate of merit at the 1947 "M.E." Exhibition. Also on view was a beautifully finished hydroplane, *Chambros II*, made of three-ply, together with a 3-c.c. engine built for this craft. An unfinished hydroplane by Mr. Bosberry was also among the marine exhibits.

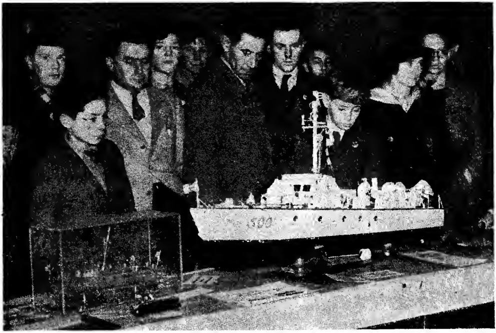


Photo by courtesy] [*The Hampshire Telegraph and Post*

Some of the marine models at the Fareham Society's exhibition

An American model jet engine which Mr. Eric See intends to fit to a racing hydroplane came in for a great deal of attention. We learn that the society already has a buoy anchored in Fareham Creek which will be used for round-the-pole speedboat racing during the coming season.

There were two model racing cars on view, one a fine streamlined free-lance job by Mr. C. Hunt and the other an unfinished 2-c.c. engine and chassis by Mr. J. Smith. The former exhibitor also showed a 15-c.c. hydroplane and the latter a 2-c.c. hydro-glider—two first-class efforts.

The society hopes to give public displays of model car racing in the near future, so we should be hearing more from Fareham of this development.

The aeronautical section was well represented by all types of planes in various stages of construction; here, too, the society hopes to show the people of Fareham what can be done by staging displays of flying models.

More than a hundred 1/72-scale model planes were exhibited by Mr. S. Chaplin on a table occupying nearly the whole length of the hall. They represented outstanding aircraft from the war types of 1914 to present day jet planes, including a Super Fortress, a small German V1, and an autogyro. The constructor of this splendid array bemoans the waste of five years away from model making whilst serving the country during the war.

A very interesting model locomotive, the "Dominion," was a centre of attraction, it was exhibited by the chairman of the Fareham Society, Mr. F. H. Bailey, and has been the means of collecting more than £700 for charity since 1931. It is a free-lance 3-cylinder 4-8-2 passenger-carrying engine, featuring in its construction the practice of four different countries, English, Canadian, French and German. Mr. Bailey helped the funds of the society in the early days by raffling a small engine. A keen model engineer of twenty years' standing, he was delighted at the success of the exhibition and was overheard to remark that "the show had hit the town a wallop."

Among the models seen in action were some interesting vertical and horizontal steam engines being run by compressed air. Almost without exception, visitors paused at these exhibits to "watch the wheels go round." Another working model was a "OO" gauge electric railway layout, built by the Secretary, Mr. A. May, which was kept running for hours by his small 9-year-old son, to the mystification of many onlookers who were unable to see anyone working the controls.

Among the loan models from the Portsmouth Society, Mr. J. Mendez's muzzle-loading gun and L. V. See's express cruiser, *Atomic II*, which gained a silver medal at the "M.E." Exhibition, were outstanding. The friendly help given by Portsmouth members in the staging of the exhibition was much appreciated by the Fareham modellers.

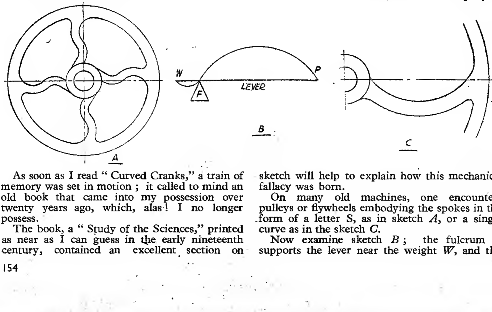
Three splendid trophies were on view, two made and presented by Mr. A. May and the third by Mr. Eric See. These will be awarded for the best exhibits in their classes, a model ship's screw mounted on a black plinth for the power boat class; a model Mercedes-Benz in polished metal for the racing cars and a model Spitfire, also in polished metal and suitably mounted for the model aircraft section. Racing competitions to be held later will also be for the award of these trophies.

The Fareham Society has made great progress and members should feel satisfied with their first effort of placing their work on view to the public. By 5 o'clock on the closing day more than three thousand visitors had each paid 6d. for admission and a number of new members had been enrolled with the society.—W. H. EVANS.

Editor's Correspondence

Curved Cranks

DEAR SIR,—It was with interest that I read Mr. F. C. Brownson's letter on the above subject, and I make this humble contribution as a point of interest to all model engineers, with no intention to decry the remarks of Mr. Brownson; or to start any controversy.



As soon as I read "Curved Cranks," a train of memory was set in motion; it called to mind an old book that came into my possession over twenty years ago, which, alas! I no longer possess.

The book, a "Study of the Sciences," printed as near as I can guess in the early nineteenth century, contained an excellent section on mechanical philosophy, from which the included sketch was taken (from memory).

The curved crank, which was eventually introduced into the wheel in the form of a series of curved spokes was based on an erroneous mechanical idea; bearing in mind the principle of the lever, a brief study of the accompanying sketch will help to explain how this mechanical fallacy was born.

On many old machines, one encounters pulleys or flywheels embodying the spokes in the form of a letter S, as in sketch *A*, or a single curve as in the sketch *C*.

Now examine sketch *B*; the fulcrum *F* supports the lever near the weight *W*, and the

power is applied; the other extremity *P*, as most of us know, as the length of the lever is increased, so is the weight *W* more easily overcome.

In the quest of "something for nothing," a means of lengthening the lever was arrived at within its original radius, which had to be maintained (for instance) in an engine with a given length of stroke. Hence the introduction of the curve by bending the lever from *F* to *P*; the lever, to all intents was lengthened, according to the amount of curve employed.

Strangely enough, this fallacy was persisted in for a great length of time, until the underlying principle had been forgotten.

Another interesting theory is that the employment of the curved spoke acts as an expansion link between the hub and the rim, the pressure being exerted towards the centre of the spoke instead of directly from the hub to the rim in the case of a straight spoke, which could, under undue expansion, burst the wheel.

Hoping this letter may be of interest to my fellow readers.

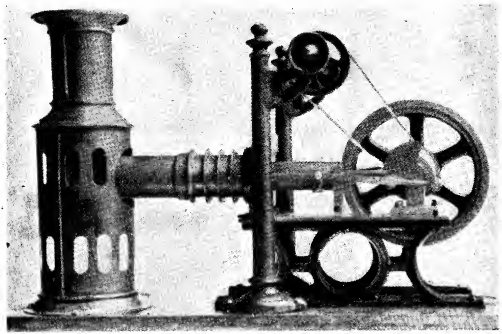
Yours faithfully,
Bearley. A. ENTWHISTLE.

Hot-air Engines

DEAR SIR,—With reference to the article by "B.C.J."—December 18th, 1947. A method of increasing the efficiency of the hot-air engine is to maintain a relatively high pressure of "working" air. If an engine were fitted with a charging pump for this purpose with suitable non-return valves, etc., this would provide an interesting experiment, but the cycle of operation is then a close parallel to the steam engine with boiler and feed pump!

The reproduced photograph is of a small hot-air engine which has been in my possession since about 1900, and is still in working order.

Yours faithfully,
Stonehouse. H. R. HOLTON.



Forty-eight years old and still working

A Bouquet—and a Half-brick

DEAR SIR,—Having in the past criticised the standard of THE MODEL ENGINEER during the past year, I must hasten to acknowledge the issue of January 15th as the best that has come along since the war. The article by "Duplex" has elated me, and I sincerely hope the future editions will include "lots and lots" more.

Perhaps the greatest sign that THE MODEL ENGINEER is on the road back to its original prestige is the fact that the horrible state of apathy that has existed in the past seems to be altering. The two letters by Mr. Lines and Mr. Walker with reference to Mr. Westbury's "Boats that go Backwards" tickled me to death. I know Mr. Westbury has many irons in the fire at the moment, but why can't we have some engine designs or articles on petrol engines which will compare with the performance of the best American engines? Has he given up the ghost, or has he something up his sleeve?

Let's have the latest "gen." It is rather like eating humble pie, when we hear that the Yanks have done over 70 m.p.h., and also the fact that that worthy gentleman, Monsieur Suzor, can wrest the laurels from us as well.

Now come along and give us a lead, please.

Yours faithfully,
Dulwich. A. W. STONE.